

In Re Patent Application of:  
**TEGGE, JR. ET AL.**  
Serial No. 10/673,869  
Filing Date: **SEPTEMBER 29, 2003**

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#### REMARKS

The Examiner is thanked for the thorough examination of the present application, and for correctly indicating the allowability of the subject matter of Claims 4-6, 9, 13-15, 18, 22-24, and 27. Dependent Claims 7, 16, and 25 have been amended to correct the noted informalities, as helpfully pointed out by the Examiner. Independent Claims 1, 10, and 19 have been amended to more clearly define the subject matter thereof over the prior art. Support for the amendments may be found in paragraphs 0044-0045 of the originally filed specification, for example. No new matter is being added.

In view of the amendments and supporting arguments presented in detail below, it is submitted that all of the claims are patentable.

#### I. The Claimed Invention

The present invention is directed to a free space optical (FSO) communications device. As recited in independent Claim 1, for example, the FSO communications device includes a plurality of power supplies having different respective output voltages, and an adaptive optics (AO) module including an AO housing and a deformable mirror carried thereby. The deformable mirror includes an array of actuators each operating based upon a supplied voltage. Furthermore, a power controller is for determining a lowest one of the output voltages that will cause the deformable mirror to correct a given optical wavefront

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distortion. The power controller also selectively drives the array of actuators using the power supply providing the determined lowest output voltage to conserve electrical power.

Independent Claim 10 is directed to a related FSO communications system. Furthermore, independent Claim 19 is directed to a related power conservation method for an FSO communications device.

## **II. The Claims Are Patentable**

The Examiner rejected independent Claims 1, 10, and 19 under 35 U.S.C. §102(e) over U.S. Patent Publication No. 2004/0017620 to Kaneko et al. This reference is directed to an optical unit including a first substrate having fixed electrodes, a second substrate having a sheet-like member, and a moving plate-spring actuator electrode. Concentric through holes are provide at the middle of the sheet-like member of the first substrate and the second substrate, and an optical element, such as a lens, a mirror, or a prism, is mounted to the through hole of the sheet-like member. When voltages applied between the fixed electrodes and the moving electrode are controlled, the sheet-like member is displaced to deform the optical element. See, e.g., paragraphs 0011-0016 of Kaneko et al.

In particular, the Examiner points to an embodiment illustrated in FIG. 18 and described in paragraph 0159 of Kaneko et al., contending that the variable resistors 34 therein provide the claimed plurality of power supplies, and that an arithmetical

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unit 38 provides the claimed power controller recited in the above-noted independent claims. The relevant portion of paragraph 0159 and FIG. 18 of Kaneko et al. are reproduced below.

"[0159] FIG. 18 shows another embodiment of the deformable mirror 33. In this embodiment, a piezoelectric element 33c is interposed between the thin film 33a and the electrodes 33b, and these are placed on a support 48. A voltage applied to the piezoelectric element 33c is changed in accordance with the individual electrodes 33b, and thereby the piezoelectric element 33c causes expansion or contraction which is partially different so that the shape of the thin film 33a can be changed. The configuration of the electrodes 33b may be selected in accordance with the deformation of the thin film 33a. For example, as illustrated in FIG. 19, it may have a concentric division pattern, or as in FIG. 20, it may be a rectangular division pattern. As other patterns, proper configurations can be chosen. In FIG. 18, reference numeral 49 represents a shake sensor connected to the arithmetical unit 38. The shake sensor 49, for example, detects the shake of a digital camera and changes the voltages applied to the electrodes 33b through the arithmetical unit 38 and the variable resistors 34 in order to deform the thin film 33a to compensate for the blurring of an image caused by the shake. At this time, the signals from the temperature sensor 39, the humidity sensor 40, and range sensor 41 are taken into account simultaneously, and focusing and compensation for temperature and humidity are performed. In this case, stress is applied to the thin film 33a by the deformation of the

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piezoelectric element 33c, and hence it is good practice to design the thin film 33a so that it has a moderate thickness and a proper strength."

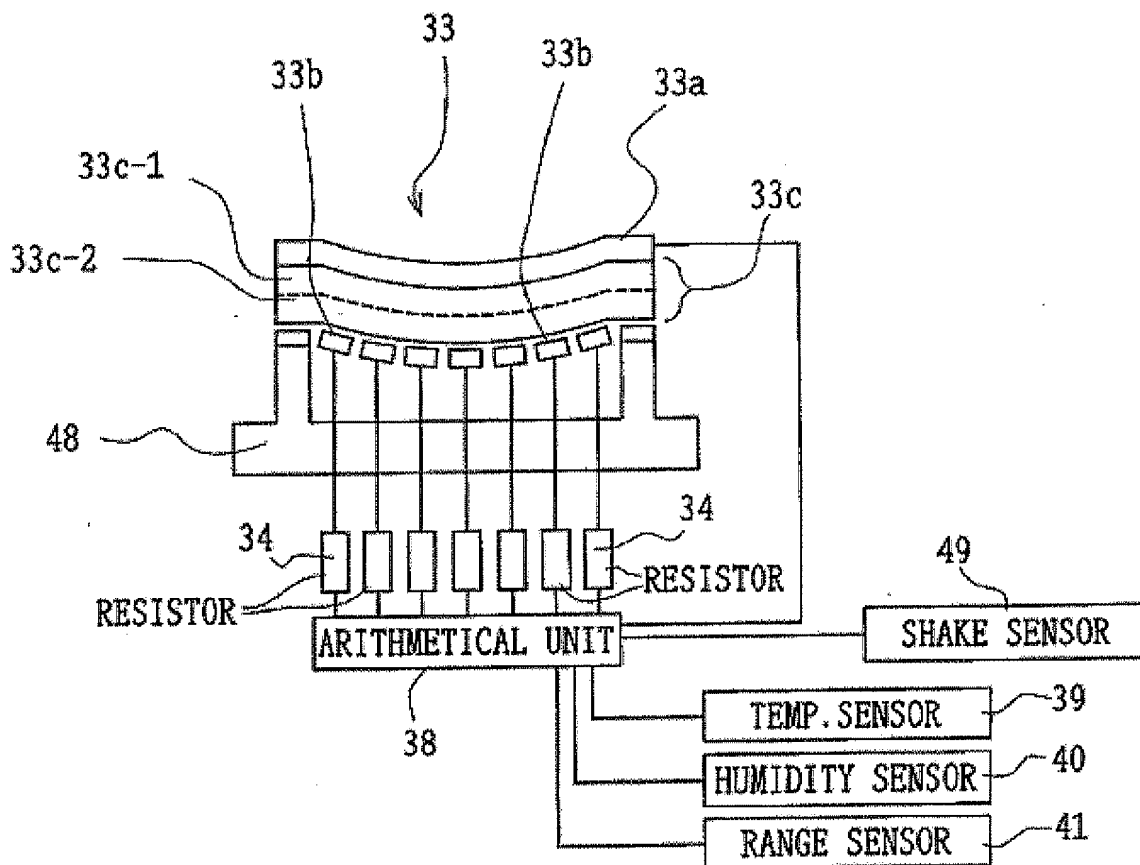


FIG. 18 of Kaneko et al.

Independent Claims 1, 10, and 19 have been amended to recite that the power controller is for determining a lowest one of the output voltages from the plurality of power supplies that

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will correct a given optical wavefront distortion, and for selectively driving the array of actuators using the power supply providing the determined lowest output voltage to conserve electrical power. As discussed at paragraphs 0045-0046 of the originally filed specification, by selecting the appropriate one of the power supplies that provides the minimum or lowest appropriate voltage to correct the distortion, the entire array of actuators need not be supplied with the maximum available voltage all of the time, which may provide significant power consumption savings. Moreover, because of the reduced power consumption, the FSO communications device may be sufficiently powered using only a battery source in some applications and avoiding a direct connection to a high voltage source.

Yet, Kaneko et al. merely teaches that the arithmetical unit 38 thereof adjusts the resistors 34 so that the piezoelectric elements 33c are driven to deform the thin film 33a into one of a concentric division pattern or a rectangular division pattern to compensate for blurring caused by shaking. Nowhere does this reference teach or fairly suggest determining a lowest output voltage that will correct a given optical wavefront distortion, and selectively driving an array of actuators using a power supply providing the determined lowest output voltage to conserve electrical power.

Since none of the remaining prior art of record teaches or fairly suggests the noted deficiencies, it is submitted that independent Claims 1, 10, and 19 are patentable over the prior

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art. Their respective dependent claims, which recite yet further distinguishing features, are also patentable over the prior art and require no further discussion herein.

**CONCLUSION**

In view of the foregoing, it is submitted that all the claims are patentable. Accordingly, a Notice of Allowance is requested in due course. Should any minor informalities need to be addressed, the Examiner is encouraged to contact the undersigned attorney at the telephone number listed below.

Respectfully submitted,



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